

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN
METHOD OF REMOVAL OF HARD-WATER SCALE
FROM U.S. ARMY KITCHEN EQUIPMENT

Headquarters, Department of the Army, Washington, D.C.
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		Paragraph	Page
SECTION I.	INTRODUCTION		
	Purpose and scope	1	1
	Use	2	1
	Errors, omissions, and recommendations	3	1
SECTION II.	HARD-WATER SCALE REMOVAL PROCEDURES		
	Coffee urn water compartments	4	1
	Bains-marie and steam tables	5	3
	Dishwashers	6	3
APPENDIX	REFERENCES		4

SECTION I

INTRODUCTION

1. Purpose and Scope. This bulletin prescribes the procedures recommended for removal of accumulated hard water scale from coffee urns, Bains-marie, and dishwashers which are approved for use within the Department of the Army. The procedures prescribed herein are supplementary to the preventive maintenance services performed by the using unit.

2. Use. This bulletin is to be used as a guide by qualified maintenance personnel in cleaning accumulated hard-water scale from U.S. Army kitchen equipment. The initial cleaning of heavily encrusted scale from the water compartment of military type coffee urns is beyond the capabilities of organizational maintenance due to the difficulty in removing frozen cleanout plugs, clogged drains, and frozen valves. The

variety of tools and skills needed makes it impractical for organizational maintenance personnel to attempt difficult repairs. Once the heavy scale deposits have been removed and regular cleaning schedules established, kitchen personnel following this technical bulletin can accomplish the cleaning at the organizational level.

3. Errors, Omissions, and Recommendations. DA Form 2028 (Recommended Changes to Publications) will be used for reporting discrepancies and recommendations for improving this bulletin. This form will be completed by the individual user and forwarded direct to the Commanding General, U.S. Army Mobility Equipment Command, AMSME-MPP, 4300 Goodfellow Blvd., St. Louis. Mo.. 63120.

SECTION II

HARD-WATER SCALE REMOVAL PROCEDURES

4. Coffee Urn Water Compartments. This paragraph includes two methods for removal of hard--water scale from the water compartments of coffee urns by

organizational and direct support maintenance personnel. Method A is to be used by organizational maintenance personnel for the routine removal of scale

when the water drain line is not clogged. Method B is to be used by direct support, maintenance personnel when heavy accumulation of scale has clogged the water drain line. The scale remover referred to throughout this section is: Scale-Removing Compound, Federal Specification P-S-120, FSN 6850-637-6142.

a. *Method A (Chemical Treatment).*

- (1) Close cold-water supply valve and turn off heat source.
- (a) Open water drain valve and empty the water compartment.
- (3) Remove tile condensate tube and vacuum relief valve. Loosen top of water-level sight glass.
- (4) Close water drain valve, open cold-water supply valve, and turn on heat.
- (5) Fill water compartment until water appears at bottom of sight glass.
- (6) Add 5 cupfuls of scale remover (one cupful equals one pound of scale remover) to the water in the water compartment by mixing one cupful at a time of the scale removal in a pitcher of water that has been drawn from the faucet. Pour this solution slowly into the water compartment through the opening in the vacuum relief valve pipe.
- (7) Heat the solution in the water compartment for 30 minutes, then check the color of the solution by withdrawing a sample from the water faucet.
- (8) If the solution is yellow, turn off the heat and add 5 more cupfuls of scale remover. Repeat, steps (6) and (7).
- (9) If the solution is still yellow after the third addition, turn off the heat, drain the water compartment, and repeat steps (4) through (7). Repeat steps (4) through (7) until the color of the solution remains pink-red after the 15 minute treatment. When the solution is pink-red, turn off the heat and drain tile solution from the water compartment.
- (10) Replace condensate tube and tighten top of sight glass. Wash out the water compartment by closing the water drain valve, opening the cold-water supply valve, and allowing the water to flow out through the condensate tube. Continue this overflow until the water does not taste sour.
- (11) Drain water compartment, replace vacuum relief valve, close water drain valve, and the urn is ready for use.

b. *Method B (Manual and Chemical Treatment).*

- (1) Drain water compartment by opening faucet.
- (2) Remove water-level sight glass and loosen the cleanout hatch cover.
- (3) Remove the cleanout hatch cover and gasket. Discard the gasket.
- (4) Manually remove all loose scale. Open drain line with a stiff wire reamer or by dissolving the scale in the drain. It may be necessary to disconnect the drain pipe in order to unclog it. The drain line may also be unclogged by putting several cupfuls of scale remover into the water compartment over the drain pipe. Fill to slightly below tile lower level of the cleanout-plug, then heat the solution. Add more scale remover when bubbling ceases or when the solution turns yellow. Continue this treatment until tile drain is opened.
- (5) Remove all loose scale.
- (6) After the drain is open, install at new gasket and replace the hatch cover.
- (7) Close water drain valve, replace water sight glass (leaving top connection loose), and remove condensate tube and vacuum relief valve.
- (8) Open the cold-water valve, turn on the heat, and fill water compartment until water appears at bottom of sight glass.
- (9) Add 5 cupfuls of scale remover to the water compartment by mixing one cupful at a time in a pitcher of water that has been drawn from the water faucet. Pour this solution *slowly* into the water compartment through the vacuum relief - valve housing opening.
- (10) Heat the solution in the water compartment for 30 minutes. Then check the color of the solution by withdrawing a sample from the water faucet.
- (11) If the solution is yellow, turn off the heat and add 5 more cupfuls of scale remover. Repeat steps (9) and (10).
- (12) If the solution is still yellow after the third addition, turn off the heat, drain the water compartment, and repeat steps (7) through (11). Repeat treatment until color

of solution remains pink-red after the 15 minute treatment. When the solution is pink-red, turn off the heat and drain the solution from the water compartment.

- (13) Replace the condensate tube and tighten top of sight glass. Wash out the water compartment by closing the water drain valve, opening the cold-water supply valve, and allowing the water to flow out through the condensate tube. Continue this overflow until the water does not taste sour.
- (14) Drain water compartment, replace vacuum relief valve, close water-drain valve, and the urn is ready for use.

5. Bains-marie and Steam Tables. This paragraph gives the procedure for removing hard water scale from Bains-marie and steam tables by organizational maintenance personnel. The scale remover referred to is: Scale Removing Compound, Federal Specification P-S-120, FSN 6850-637-6142.

- a. Close drain valve.
- b. Insert, overflow tube in outlet.
- c. Fill with enough water to cover the scale remover.
- d. Sprinkle 2 cupfuls of scale remover into the steam bath or Bains-marie while the water is being added.
- e. As soon as the scale area is covered, turn on heat source and heat the solution for 30 minutes.
- f. Check color of solution every five minutes. If the color of the solution changes from red to yellow, add more scale remover until the solution remains pink-red.

g. When all the scale has been dissolved, rinse the equipment thoroughly with fresh water.

6. Dishwashers. This paragraph gives the procedure for removing hard-water scale from dishwashers, by organizational maintenance personnel. For scale remover, use Scale--Removing Compound P-S-120, FSN 6850-637-6142.

- a. Drain both wash and rinse tanks.
- b. Close the wash-and-rinse-tank drain valves. Add about 12 gallons of hot water to the tank (or to each tank of dual-tank machine).
- c. Sprinkle approximately one cupful of scale removing compound on the scrap trays of both the rinse and wash compartments.
- d. Start recirculation of the solution without the addition of water. Regulate heat source to maintain a temperature between 1600 F and 1900 F. Check color of solution every 10 minutes. Carbon dioxide is evolved as long as scale and scale remover are present, and the solution will remain red as long as the scale remover is present.
- e. If scale is not completely removed and the solution is yellow, sprinkle another cupful of the scale remover on each scrap tray. Continue recirculation. Swab untouched scaled areas with the solution. Add more remover if required. Scale on the final spray headers may be removed by using a brush and a small amount of remover made into a paste with water.
- f. After the scale is removed, gases cease to form and the color of the solution remains pink-red. Drain the solution.
- g. Fill both wash and drain tanks with fresh water. Circulate for 5 minutes. Drain wash water.
- h. Refill the tanks and repeat operation in step g until wash water does not taste sour.

APPENDIX
REFERENCES

TM 5-636	Kitchen Equipment Repairs and Utilities
TM 5-637	Inspection and Preventive Maintenance Services for Kitchen Equipment
TM 10-405	Army Mess Operations
TM 10415.....	Operation of Garrison Mess Equipment

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NG: State AG (3); Units-Same as Active Army.

USAR: Same as Active Army except allowance is one (1) copy for each unit.

For explanation of abbreviations used, see AR 320-50.

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THE METRIC SYSTEM AND EQUIVALENTS

WEIGHT MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
 1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
 1 Kilogram = 1000 Grams = 2.2 lb.
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

TEMPERATURE

$5/9(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32.2° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 $9/5^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
its	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
ometers per Liter	Miles per Gallon	2.354
ometers per Hour	Miles per Hour	0.621



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